

Spot Safety Project Evaluation

Project Log # 200501203

Spot Safety Project # 14-97-017

**Spot Safety Project Evaluation of the Directional Crossover Installation,
At the Intersection of US 23-74 at SR 1527-Steeple Drive and SR 1449-Cope Creek Road
Near Sylva, Jackson County**

Documents Prepared By:

Safety Evaluation Group
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9/14/05

Date

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 14-97-017 – The Intersection of US 23-74 at SR 1527-Steeple Drive and SR 1449-Cope Creek Road, near Sylva, Jackson County

Introduction

In an attempt to assess the safety of our roads, the Safety Evaluation Group of the Traffic Safety Systems Management Section has evaluated the above project. The methodologies used in this evaluation offer various philosophies and ideas, in an effort to provide objective countermeasure crash reduction results. A naive before and after analysis has been completed to measure the effectiveness of the spot safety improvement. Additional analysis methods were not utilized for this evaluation because a suitable comparison group was unattainable. This information is provided to you so the benefit or lack of benefit for this type of project can be recognized and utilized for future projects.

Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the construction of raised islands in the crossover to prevent through and left turn movements from the side street approaches. Also, a U-turn lane was constructed on the Exit 85 ramp to accommodate U-turns and Left turns denied at the treatment location. R.E. Moore, Division Traffic Engineer, originally requested the directional crossover. US 23/74 is a four-lane divided facility with a speed limit of 55 mph at this location. Both side streets currently have dually posted yield signs.

The initial crash analysis for this location was completed from January 1, 1992 through August 31, 1996 with a total of 17 reported Angle crashes. In the Spot Safety Project Justification Sheet, the problem is stated as side street delay. In addition, motorists on US 23/74 making left turns and U-turn movements were having difficulty finding gaps in traffic. The treatment location met signal warrants; however, it was felt that the directional crossover would better preserve the capacity and integrity of the expressway.

The improvement countermeasure was meant to accomplish the following objectives:

- Reduce the frequency of crashes at the intersection;
- Preserve the freeway character of US 23-74;
- Serve the directional turning demand from US 23-74; and
- Serve the side street demands for Right Turns, Left Turns, and Through Movements.

The final completion date for the directional crossover installation at the subject intersection was on December 28, 1998.

Naive Before and After Analysis

After reviewing the spot safety project file folder along with all the crashes at the subject location, the crash data omitted from this analysis to consider for an adequate construction period was from November 1, 1998 through February 28, 1999. The before period consisted of reported crashes from November 1, 1992 through October 31, 1998 (6 Years) and the after period consisted of reported crashes from March 1, 1999 through February 28, 2005 (6 Years). The ending date for this analysis was determined by the available crash data at the time the crash analysis was completed. Please see attached the *Location Map* (including aerial photographs) for further detail.

The attached data Table 1 depicts the Naive Before and After Analysis for the Treatment Intersection, consisting of an overall crash summary and a crash type summary. The overall crash summary contains high level crashes and vehicle exposure statistics. The crash type summary contains crashes broken down by accident type. Before period crash data, after period crash data, and the percent change in crashes from the before to the after period are also included. The treatment data consisted of crashes within a 150 feet Y-Line of the subject intersection, excluding crashes at the intersection of SR 1449 and SR 1527 (which is located approximately 50 feet south of the treatment intersection).

As shown in Table 1, the naive before and after analysis at the Treatment Intersection resulted in a 53.3 percent decrease in Total Crashes, a 41.4 percent decrease in the Total Severity Index, and a 18.3 percent increase in Average Daily Traffic (ADT). The before period ADT year was 1995, and the after period ADT year was 2002. Analysis of the treatment location also resulted in a 100.0 percent decrease in Angle crashes and a 72.7 percent decrease in Frontal Impact crashes.

In order to test for crash migration, a naive before and after analysis was also performed at the crossovers west and east of the treatment location. The two intersections with US 23-74 that were analyzed are as follows: US 23-74 at Exit 85 Ramp U-turn and US 23-74 at SR 1788-Hidden Valley Road. The data for both intersections consisted of all crashes within a 150 feet Y-line. The following table is a summary of Total Crashes at both treatment influenced intersections. As shown below, the naive before and after analysis at the crossovers surrounding the treatment intersection resulted in a minimal increase in Total Crashes.

Overall Total Crash Summary of Treatment Influenced Intersections

	Before	After	Percent Reduction (-)/ Percent Increase (+)
Treatment Intersection	30	14	- 53.3
US 23-74 at SR 1788-Hidden Valley Road	3	3	0.0
US 23-74 at Exit 85 Ramp U-turn	0	2	100.0

Results and Discussion

The naive before and after analysis at the Treatment Intersection resulted in a 53.3 percent decrease in Total Crashes and a 41.4 percent decrease in the Total Severity Index. Analysis of the treatment location also resulted in a 72.7 percent decrease in Frontal Impact Crashes. The summary results above demonstrate that when using the naive before and after analysis method the treatment location appears to have had a reduction in the frequency and severity of crashes from the before to the after period.

The raised islands constructed in the treatment crossover prevent through and left turn movements for both side street approaches. Motorists wishing to make these movements need to find an alternative route (i.e. potential crash migration occurs). Therefore, the effect of the treatment location on the surrounding intersections must remain in consideration while assessing the analysis of the Treatment Intersection. The crossover at SR 1788-Hidden Valley Road existed for both the before and the after period. As previously stated, the U-turn was constructed on the Exit 85 Ramp as part of the project improvement, to allow traffic to U-turn back onto the eastbound On-Ramp. There was no change in the number of crashes at the SR 1788-Hidden Valley Road crossover from the before period to the after period. Only two crashes occurred at the Exit 85 U-turn in the after period. It appears that the treatment intersection has had minimal impact on the number of crashes at the surrounding U-turn locations.

In the after period, three crashes occurred at the treatment location that involved eastbound US 23-74 vehicles making a U-turn and being struck by oncoming westbound US 23-74 vehicles. One of these crashes resulted in a fatality. A bulb-out is provided for the U-turning movement; however, there is no acceleration lane provided for motorists to gain speed after making the U-turn movement. US 23-74 carries a high volume of traffic, most of which appeared to be travelling at or over 55 mph during the site visit. While viewing the location, it appeared that most U-turning motorists were either getting stuck in the bulb-out or completed their movement and were almost rear-ended by oncoming vehicles. Four Left-Turn, Same Roadway crashes also occurred at the treatment location in the after period. All of these involved eastbound US 23-74 motorists turning in front of westbound US 23-74 motorists. "U-turn Traffic Entering" signs are currently placed in advance of the treatment intersection on both US 23-74 approaches. However, westbound travelling motorists may require more notification that traffic is entering the treatment intersection ahead.

Please see the attached *Treatment Site Location Photos*. Photos are provided of the treatment intersection and of the surrounding U-turn locations. The photos show the current signage directing motorists to the nearest U-turn locations. In addition, the photos show the "U-turn Traffic Entering" signs located on US 23-74 in advance of the treatment location.

The countermeasure crash reduction for Total Crashes at the subject intersection is a 53.3 percent decrease in crashes. The countermeasure crash reduction for Frontal Impact Crashes at the subject intersection is a 72.7 percent decrease in crashes. As the Safety Evaluation Group completes additional spot safety reviews for this type of countermeasure, we will be able to provide objective and definite information regarding actual crash reduction factors.

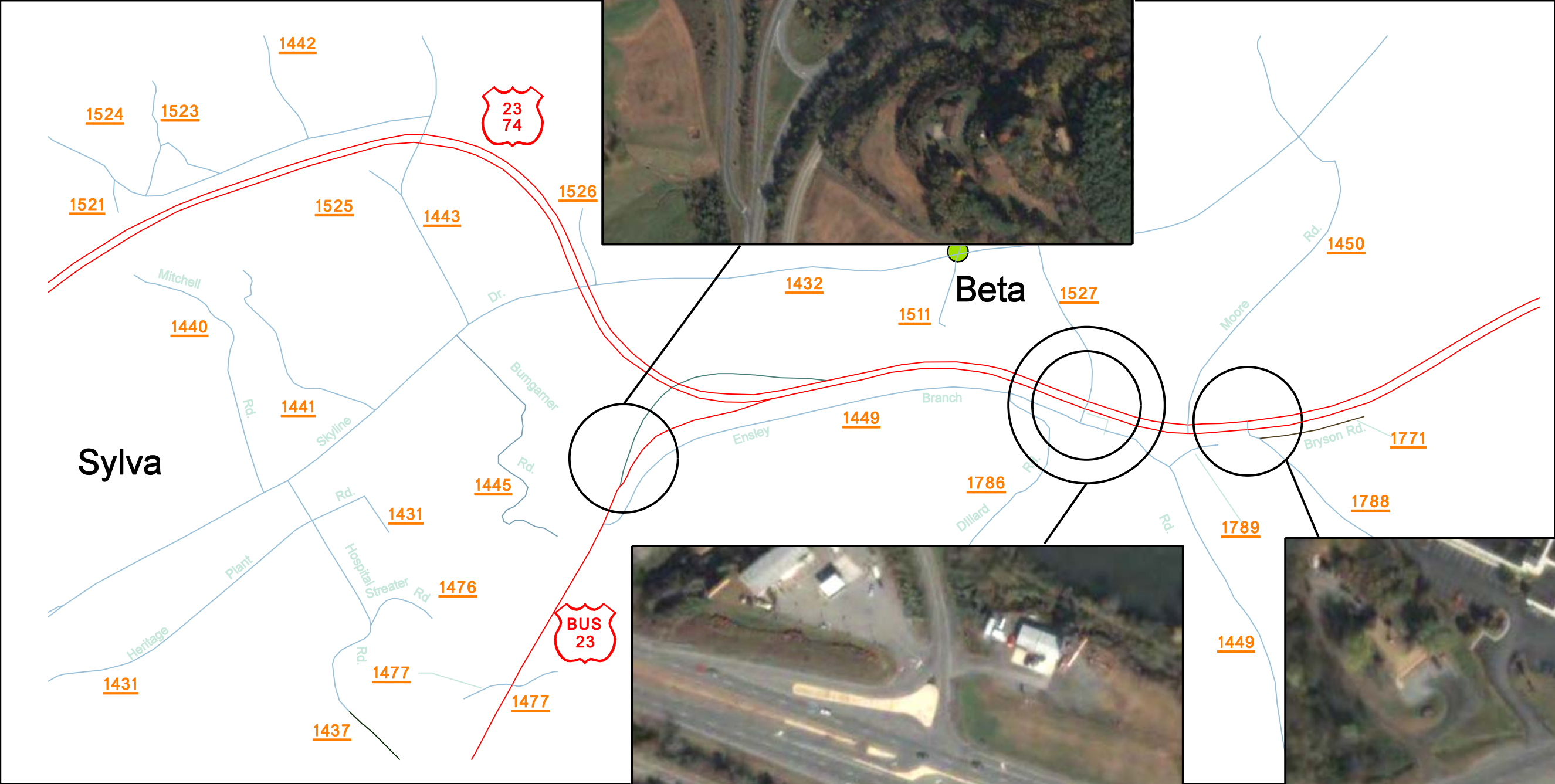
Table 1. Treatment Intersection Overall Crash Summary and Crash Type Summary

OVERALL CRASH SUMMARY	Before Period	After Period	Percent Change
Total Crashes	30	14	-53.3
Fatal Crashes	1	1	0.0
Non-Fatal Injury Crashes	17	4	-76.5
Total Injury Crashes	18	5	-72.2
PDO Crashes	12	9	-25.0
Night Crashes	2	1	-50.0
Wet Crashes	2	1	-50.0
Annual ADT	16900	20000	18.3
Total Vehicle Exposure	37.03	43.84	18.4
Severity Index	14.56	8.53	-41.4

CRASH TYPE SUMMARY	Before Period	After Period	Percent Change
Angle*	14	0	-100.0
Fixed Object	0	1	n/a
Head On*	1	1	0.0
Left Turn, Different Roadways*	4	0	-100.0
Left Turn, Same Roadway*	3	5	66.7
Other Collision With Vehicle	0	2	n/a
Ran Off Road - Right	1	0	-100.0
Rear End, Slow or Stop	4	3	-25.0
Rear End, Turn	1	0	-100.0
Sideswipe, Same Direction	2	2	0.0

* Denotes Frontal Impact Crashes

Location Map
Near Sylva, Jackson County
Spot Safety Project # 14-97-017



US 23-74 at US 23B



US 23-74 at SR 1527-SR1449



US 23-74 at SR 1788

Treatment Site Photos (Taken on July 28, 2005)



Looking north on SR 1449 at the Treatment Location
Notice the “U-Turn To South US 23/ West US 74” sign located to the right of the Yield signs.



Looking west on SR 1527 at the Treatment Location
Notice the “U-Turn To North US 23/ East US 74” sign located to the right of the Yield signs.

Treatment Site Photos (Taken on July 28, 2005)



Looking west on US 23-74 at the Treatment Location



Looking west on US 23-74 at the Treatment Location
Notice the Bulb-Out for motorists making U-turn movements from the Crossover.

Treatment Site Photos (Taken on July 28, 2005)



Looking east on US 23-74 at the Treatment Location



Both photos above taken while driving towards the Treatment Intersection.
Notice the "U Turn Traffic Entering" Signs Posted on both US 23-74 approaches.

Treatment Site Photos (Taken on July 28, 2005)



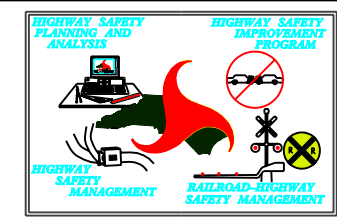
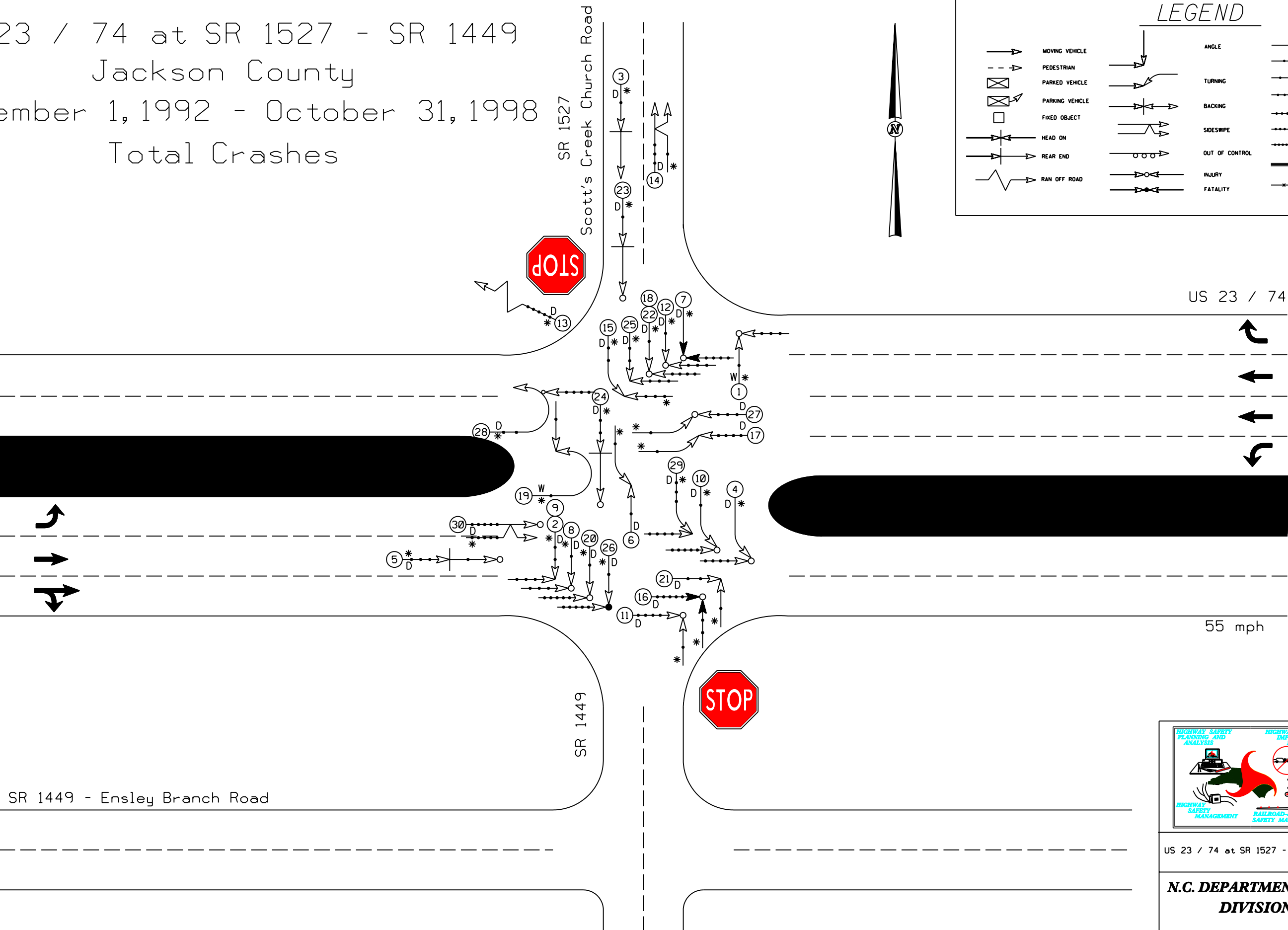
Looking east towards the intersection of US 23-74 and SR 1788-Hidden Valley Road



Photo above taken on the Exit 85 ramp, just prior to the U-turn. Notice the Left Lane U-turn sign.

Photo at left is of the U-turn. Traffic exits the ramp and is allowed to U-turn back onto the eastbound US 23-74 On-Ramp.

US 23 / 74 at SR 1527 - SR 1449
Jackson County
November 1, 1992 - October 31, 1998
Total Crashes



US 23 / 74 at SR 1527 - SR 1449

STUDY PERIOD: 11/1/1992 - 10/31/1998
ANALYSIS PREPARED BY: C. Simpson
DIAGRAM PREPARED BY: C. Simpson
SCALE: NOT TO SCALE
DATE: 8/22/2005
LOG NUMBER: 20050203

N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS

US 23 / 74 at SR 1527 - SR 1449
Jackson County
March 1, 1999 - February 28, 2005
Total Crashes

LEGEND

→

MOVING VEHICLE

→

PEDESTRIAN

⊠

PARKED VEHICLE

⊠

PARKING VEHICLE

□

FIXED OBJECT

⊕

HEAD ON

⊖

REAR END

⊗

RAN OFF ROAD

↘

ANGLE

↶

TURNING

↶

BACKING

↶

SIDESWIPE

○

OUT OF CONTROL

⊕

INJURY

⊗

FATALITY

→

9 MPH OR LESS

→

10 MPH TO 19

→

20 MPH TO 29

→

30 MPH TO 39

→

40 MPH TO 49

→

50 MPH TO 59

→

60 MPH TO 69

→

70 AND UP

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SPEED UNKNOWN

P

PEDESTRIAN

T

TRAIN

•

DRIVER AT FAULT

D

DRY

W

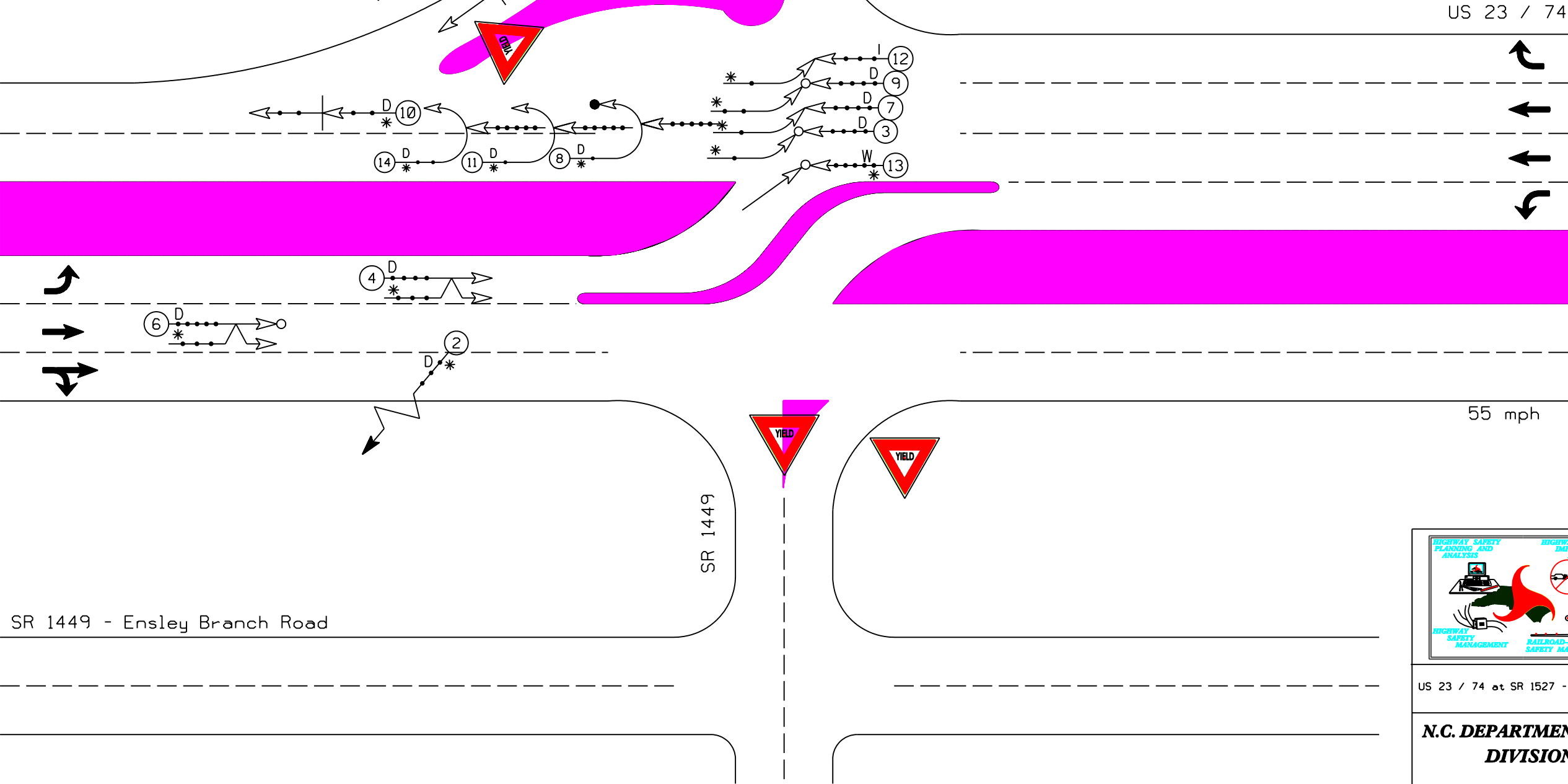
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HIGHWAY SAFETY
PLANNING AND
ANALYSIS

HIGHWAY SAFETY
IMPROVEMENT
PROGRAM

HIGHWAY
SAFETY
MANAGEMENT

RAILROAD-HIGHWAY
SAFETY MANAGEMENT

US 23 / 74 at SR 1527 - SR 1449

8/22/2005

LOG NUMBER: 20050203

STUDY PERIOD: 3/1/1999 - 2/28/2005

ANALYSIS PREPARED BY: C Simpson

DIAGRAM PREPARED BY: C Simpson

SCALE: NOT TO SCALE

LOG NUMBER: 20050203

N.C. DEPARTMENT of TRANSPORTATION

DIVISION of HIGHWAYS

Collision Diagram and LocMap.dgn 10/21/2005 10:39:07 AM